

WHAT IS CLAIMED IS:

1. An apparatus for reading a recording medium, comprising:  
a determining unit that determines whether an error detected by using an error  
correcting code is correctable with respect to a signal sequence read from the  
5 recording medium; and  
a decoding unit that performs maximum a posteriori decoding of the signal  
sequence upon the determining unit determining that the error is not correctable.
2. The apparatus according to claim 1, further comprising:  
10 an internal code decoder that calculates a first reliability information and an  
external information; and  
an external code decoder that calculates, based on the external information, a  
second reliability information with respect to a maximum a posteriori decoding  
sequence to output the maximum a posteriori decoding sequence based on the  
15 second reliability information calculated, wherein  
the decoding unit performs maximum a posteriori decoding of the signal  
sequence by repetitively using the internal code decoder and the external code  
decoder until a repetition end condition is satisfied.
- 20 3. The apparatus according to claim 2, wherein  
the internal code decoder is a BCJR decoder, and  
the external code decoder is an LDPC decoder.
4. The apparatus according to claim 2, wherein  
25 the internal code decoder is a decision aided equalizer decoder, and

the external code decoder is a turbo decoder.

5. The apparatus according to claim 1, wherein the decoding unit includes  
a Viterbi decoding unit that outputs a Viterbi decoding sequence by performing  
5 maximum likelihood decoding based on Viterbi decoding of the signal sequence; and  
a noise estimate post processing unit that creates a filter passing sequence by  
filtering the Viterbi decoding sequence based on a channel signal characteristic and a  
channel noise characteristic, and that performs an error correction of the Viterbi  
decoding sequence by using the filter passing sequence and the signal sequence.  
10
6. The apparatus according to claim 1, wherein the decoding unit includes  
a noise estimate Viterbi decoding unit that performs a Viterbi decoding using  
channel information based on a channel signal characteristic and a channel noise  
characteristic, wherein  
15 the decoding unit performs maximum likelihood decoding of the signal  
sequence by Viterbi decoding.
7. The apparatus according to claim 1, further comprising:  
a syndrome generating unit the generates a syndrome based on a check  
20 matrix of the error correcting code and the signal sequence, wherein  
the determining unit determines whether the error is correctable by using the  
syndrome generated.
8. The apparatus according to claim 7, wherein the error correcting code is a  
25 Reed-Solomon code.

9. A method for reading a recording, comprising:  
determining whether an error detected by using an error correcting code is correctable; and  
performing maximum a posteriori decoding of a signal sequence read from  
5 the recording medium upon determining that the error is not correctable.

10. The method according to claim 9, wherein the maximum a posteriori decoding of the signal sequence is performed by repetitively using an internal code decoder and an external code decoder until a repetition end condition is satisfied, wherein  
10 the internal code decoder calculates a first reliability information and an external information, and  
the external code decoder calculates, based on the external information, a second reliability information with respect to a maximum a posteriori decoding sequence to output the maximum a posteriori decoding sequence based on the  
15 second reliability information calculated.

11. The method according to claim 10, wherein  
the internal code decoder is a BCJR decoder, and  
the external code decoder is an LDPC decoder.

20

12. The method according to claim 10, wherein  
the internal code decoder is a decision aided equalizer decoder, and  
the external code decoder is a turbo decoder.

25

13. The method according to claim 9, wherein the performing includes  
outputting a Viterbi decoding sequence by performing maximum likelihood  
decoding based on Viterbi decoding of the signal sequence;  
creating a filter passing sequence by filtering the Viterbi decoding sequence  
5 based on a channel signal characteristic and a channel noise characteristic; and  
performing an error correction of the Viterbi decoding sequence by using the  
filter passing sequence and the signal sequence.
14. The method according to claim 9, wherein the performing includes  
10 Viterbi decoding the signal sequence by using channel information based on a  
channel signal characteristic and a channel noise characteristic; and  
performing maximum likelihood decoding of the signal sequence by the Viterbi  
decoding.
15. The method according to claim 9, further comprising:  
generating a syndrome based on a check matrix of the error correcting code  
and the signal sequence, wherein  
the determining determines whether the error is correctable by using the  
syndrome generated.  
20
16. The method according to claim 15, wherein the error correcting code is a  
Reed-Solomon code.
17. A hard disk controller used in an apparatus for reading a recording medium,  
25 comprising:

a determining unit that determines whether an error detected by using an error correcting code is correctable with respect to a signal sequence read from the recording medium;

a decoding unit that performs maximum a posteriori decoding of the signal sequence, upon the determining unit determining that the error is not correctable;

a correcting unit that detects an error by using the error correcting code with respect to the signal sequence, and corrects the detected error; and

a checking unit that checks whether the error correction by the correcting unit is correct.

10

18. The hard disk controller according to claim 17, wherein the decoding unit includes

a Viterbi decoding unit that outputs a Viterbi decoding sequence by performing maximum likelihood decoding based on Viterbi decoding of the signal sequence; and

15 a noise estimate post processing unit that creates a filter passing sequence by filtering the Viterbi decoding sequence based on a channel signal characteristic and a channel noise characteristic, and that performs an error correction of the Viterbi decoding sequence by using the filter passing sequence and the signal sequence.

20 19. The hard disk controller according to claim 17, wherein the decoding unit includes

a noise estimate Viterbi decoding unit that performs a Viterbi decoding using channel information based on a channel signal characteristic and a channel noise characteristic, wherein

25 the decoding unit performs maximum likelihood decoding of the signal

sequence by Viterbi decoding.

20. The hard disk controller according to claim 17, further comprising:  
a syndrome generating unit the generates a syndrome based on a check  
5 matrix of the error correcting code and the signal sequence, wherein  
the determining unit determines whether the error is correctable by using the  
syndrome generated.